REMARKS

Claims 1 – 36 are presently pending. In the above-identified Office Action, the Examiner rejected Claims 1 – 7, 9 – 28 and 30 – 35 under 35 U.S.C. 102(b) as being anticipated by Turpin (US 5,751,243). Claims 8 and 36 were rejected under 35 U.S.C. 103(a) as being unpatentable over Turpin in view of Blecha *et al.* (US 5,510,618).

By this Amendment, Applicant has canceled Claims 32 - 36, has amended a number of claims to add limitations as will be explained below and has added new Claims 37-44. Therefore, Claims 1 - 28, 30, 31 and 37 - 44 are presented. For the reasons set forth below, Applicant respectfully submits that the subject Application properly presents allowable claims. Reconsideration, allowance and passage to issue are respectfully requested.

The invention is set forth in claims of varying scope of which amended Claim 1 is illustrative. Claim 1 recites:

> 1. An imaging system comprising:
> first means mounted on a mobile platform for receiving reflected beams of electromagnetic energy; and
> second means for **combining the reflected beams with reference beams to form a plurality of interference patterns;**
> third means for **motion compensating the plurality of interference patterns** and for **recording the plurality of motion compensated interference patterns.** (Emphasis added.)

None of the references, taken alone or in combination, anticipates or makes obvious the invention as presently claimed. That is, the references, and especially Turpin, fail to disclose the formation of **a plurality of interference patterns** and the **recording of the plurality of interference patterns** where the interference patterns are **motion compensated.**

The Examiner in the above-identified Office Action relied heavily on the Turpin reference in rejecting the claims. Applicant contends that this reliance is misplaced. Turpin discloses a complicated and time consuming imaging system that uses time sequential holography. Turpin discloses that there are known holographic techniques and that "amplitude and phase information may be obtained by simultaneously interfering a received wave and a reference wave of constant frequency and phase **on a recording**

medium. In the present invention the technique for obtaining amplitude and phase information may differ from such known holographic techniques in at least several respects. For example, in the present invention in contrast to known holographic techniques, the **recording of each basis function** does not need to occur simultaneously. Moreover, in the present invention, in contrast to known holographic techniques, the waves are **not required to be mutually coherent.**" (Emphasis added.) (Turpin, col. 13, lines 46-57.)

First, Applicant combines the reflected signal and a reference signal to form an interference pattern **before reaching the recording medium.** Second, Applicant forms a **plurality of interference patterns** and third, **records those interference patterns.**

Turpin also discloses that a "motion compensator 108 may optionally be used **to correct the return signal output of the receiver 94** for effects caused by the motion of the aircraft 96." (Emphasis added.) (Turpin, col. 14, lines 51-53.) Applicant **motion compensates the interference patterns** and not the return signal.

Applicant's invention is also set forth in other claims that include negative limitations to distinguish Turpin, of which new Claims 37 - 42 are illustrative. Claims 37 - 42 recite:

> 37. An imaging system comprising:
> first means mounted on a mobile platform for receiving electromagnetic energy reflected from a target; and
> second means for combining the reflected energy with a reference beam of electromagnetic energy to reconstruct an image of the target **without utilization of a vector spatial frequency parameter.** (Emphasis added.)
>
> 38. An imaging system comprising:
> first means mounted on a mobile platform for receiving electromagnetic energy reflected from a target; and
> second means for combining the reflected energy with a reference beam of electromagnetic energy to reconstruct an image of the target **without first decomposing the image of the target using a transformation.** (Emphasis added.)
>
> 39. An imaging system comprising:
> first means mounted on a mobile platform for receiving electromagnetic energy reflected from a target; and
> second means for combining the reflected energy with a reference beam of electromagnetic energy to reconstruct an image of the target **without integration over spatial frequency.** (Emphasis added.)

> 40. An imaging system comprising:
> first means mounted on a mobile platform for receiving electromagnetic energy reflected from a target; and
> second means for combining the reflected energy with a reference beam of electromagnetic energy to reconstruct an image of the target **without use of a controller that extracts amplitude and phase of reflected electromagnetic energy.** (Emphasis added.)
>
> 41. An imaging system comprising:
> first means mounted on a mobile platform for receiving electromagnetic energy reflected from a target; and
> second means for combining the reflected energy with a reference beam of electromagnetic energy to reconstruct an image of the target **without use of a controller that controls amplitude, phase and spatial frequency of a synthesized optical wave pattern.** (Emphasis added.)
>
> 42. An imaging system comprising:
> first means mounted on a mobile platform for receiving electromagnetic energy reflected from a target; and
> second means for combining the reflected energy with a reference beam of electromagnetic energy to reconstruct an image of the target **without use of a basis function generator.** (Emphasis added.)

Applicant's system is very different from and much less complicated than the Turpin system. In summary, Turpin uses a **vector spatial frequency parameter** as the space for mathematically **decomposing his image** as a series of characteristic vectors or eigenfunctions within a particular basis set, those eigenfunctions representing the angular order of **Bragg diffraction** which occurs as light hits the target. Turpin's spatial frequency may be quantified in units of "lines per millimeter" or "resolution elements per millimeter." He collects intensity and phase information at each Bragg order (angular position around the target) and this is done sequentially by physically moving his lens system. Turpin's TSH algorithm then processes the intensity and phase information from each of these measurements, transforming them into a displayable 3-D image. This process is complicated and takes much too long to be practical for many applications.

Applicant does not decompose the image using a transformation, such as Bragg diffraction, and Applicant does not use vector spatial frequency as a parameter space.

More specifically, Turpin discloses a system that "utilizes the amplitude, phase and vector spatial frequency of each basis function to generate a reconstructed image of an object. A sensing system performs the function of measuring the amplitude and phase of the individual basis function components of the object, project them onto a photosensor array and integrate them to form an image on a display device." (Turpin, col.

5, lines 10-18.) The "preferred embodiment (of) a TSH system in accordance with the present invention comprises two basic parts: a sensing system 2 and an image synthesis system 4. The sensing system 2 generally includes both a transmitter 6 and a receiver 8." (Turpin, col. 5, lines 21-25.) "The receiver 8 receives a signal reflected by the object 10 and compares the received signal to a reference signal. The amplitude and phase of the basis functions of the object 10 may be obtained by this comparison. The receiver 8 produces an output signal that corresponds to the amplitude and the phase of the received signal." (Turpin, col. 5, lines 47-51.)

The image synthesis system "in its preferred embodiment (includes) **a controller** 12 ...as the front-end of the (image synthesis system) 4. The controller 12 ...provides drive signals to the transmitter 6, obtains data from the receiver 8, controls the operation of the (image synthesis system) 4, and coordinates the timing of the TSH process. The controller 12 may also **determine the parameters of the basis functions** measured in the object 10 and communicates those parameters to the remainder of the (image synthesis system) 4. The controller 12 **provides the transmitter 6 with the frequency parameters necessary to extract a specific basis function from the object 10**. The frequency parameter, together with the know geometry of the system, monitored by the controller 12, determines the two- or three-dimensional **spatial frequency components of a given basis function.**" (Emphasis added.) (Turpin, col. 5, lines 61-69.)

"The controller 12 extracts the amplitude and the phase of the received signal from the receiver 8. The controller 12 uses the amplitude and the phase of the received signal and geometry information to **control the amplitude, phase, and spatial frequency of an optical wave pattern synthesized by the basis function generator** 14. The controller also sets the timing of the outputs of the basis function generator 14 and the integrator 16. **(The) basis function generator 14...uses the amplitude, phase, and spatial frequency outputs from the controller 12 to generate a scaled copy of the object basis function.** The basis function may be recreated by the interference of optical waves. (A) photosensor array integrates many basis functions before outputting the result to (the) integrator 16. **The integrator 16 performs the function of digitizing and summing the basis functions from the basis function generator** 14 and outputting a reconstructed image to a display 18." (Emphasis added.) (Turpin, col. 6, lines 14-36.)

It is important to note that Turpin does not teach extracting amplitude and phase information by using **motion compensated interference patterns**. Also, Applicant does use a controller, a basis function generator or an integrator as these devices are disclosed by Turpin.

More particularly, when Turpin uses his "second alternative sensing method" of optical radiation his "sensing method comprises creating a set of fringes **on the object** by interfering a reference wave and a transmitted wave **on the object** and measuring scattered amplitude. FIG. 10 illustrates an example of the second alternative sensing method using optical radiation ...The transmitter comprises coherent light source 122 emitting a plane wave 124. **A second plane wave 126** may be produced either by a source coherent with the first or by a reflection on the first wave 129. The interference of the two plane waves **on the object 120 produces a set of uniformly spaced two-dimensional sinusoids** referred to as fringes. The sinusoidal phase fronts are depicted as lines 128 in FIG. 10. (T)he controller 118 is used to control the position of the object 120 relative to a transmitter and a receiver, so that the **spatial frequency of fringes on the object may be varied.** For example, the object 120 may place on a rotating platen 136, rotation of which is determined by the controller 118. The controller 118 also controls and monitors the angle at which the transmitted wave 124 and the reference wave 126 **interfere on the object 120** The amplitude of the object's basis function may be obtained by passing light scattered by the object through a collecting lens 132 onto a photodetector 134. The photodetector 134 produces a signal that is proportional to the intensity of the scattered light. The amplitude and the phase of the object component may be obtained form a pair of intensity measurements...the **Bragg condition** assures sensing of a particular frequency component of the object. (Emphasis added.) (Turpin, col. 15, lines 20-59.)

None of the highlighted phrases in the above paragraph apply to Applicant's invention.

In contrast, the Applicant collects intensity and phase information in the form of a holographic interference pattern at each position within the whole synthetic aperture as the aircraft flies. Applicant uses a 2-D Fourier transform algorithm to transform the total interference pattern into a displayable 2-D image. In the photographic plate hologram

embodiment, this algorithm is a lens system. In another embodiment, the algorithm is a form of computational real-time holography.

Finally, the Examiner in the above identified Office Action made a mistake at page 2, five lines form the bottom of the page. There, the Examiner states that Turpin discloses that "the images of the target are detected and recorded by photosensor." In the claims of the Application no images of the target are ever detected or recorded by a photosensor. What is recorded in Applicant's claims are the interference patterns located in an optical plane that is conjugate to the physical aperture and not images of the target. What Applicant teaches that a photosensor collects the interference patterns which carry the near-field phase and intensity information about the target image that a computer uses to synthesize a far-field picture of the target using a 2-D Fourier transformation algorithm. Turpin is actually imaging the target, or a least a component of the target image associated with a particular Bragg diffraction order. Turpin's image is therefore a component of the Fourier transform of the target information Applicant is detecting. These are not the same thing. Reconstruction of the full image of the target in the Turpin system requires a tomography algorithm that is very different from the Fourier transform algorithm used in Applicant's system. As explained at page one of the Application, current SAL systems are too complex, too costly and too time consuming, and the Turpin reference exemplifies these problems.

Accordingly, Claims 1 - 48 should be allowable. Reconsideration, allowance and passage to issue are respectfully requested.

Respectfully submitted,
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